Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	**Erbil Technical Engineering College**	
Department	**Mechanical and Energy Engineering Techniques**	
Module Name	**Fluid Mechanics 2**	
Module Code	**FLM401**	
Degree	**Technical Diploma** ☐ **Bachler** ■ **High Diploma** ☐ **Master** ☐ **PhD** ☐	
Semester	**4th**	
Qualification	**Ph.D.**	
Scientific Title	**Assistant Professor**	
ECTS (Credits)	**5**	
Module type	**Prerequisite** ☐ **Core** ■ **Assist.** ☐	
Weekly hours	**4 hours**	
Weekly hours (Theory)	**(2)hr Class**	**(28)Total hrs Workload**
Weekly hours (Practical)	**(2)hr Class**	**(27)Total hrs Workload**
Number of Weeks	**12**	
Lecturer (Theory)	**Dr. Banipal N. Yaqob**	
E-Mail & Mobile NO.	**banipal.yaqob@epu.edu.iq**	
Lecturer (Practical)		
E-Mail & Mobile NO.		
Websites	**https://moodle.epu.edu.iq/course/view.php?id=3729**	

Course Book

Course Description	The course begins with flow of viscose fluid applied to a range of problems in mechanical engineering, including steady flow in pipes, design of pump and turbine-pipeline systems, series-parallel piping systems, cavitation, …etc. The next section deals with applying momentum equation to find forces on bends, nozzles and solid bodies. Students will work to formulate the models necessary to study, analyse, and design fluid systems through the application of these concepts, and to develop the problem-solving skills essential to good engineering practice of fluid mechanics in practical applications.
Course objectives	The course objective is to provide students with the fundamental physical and analytical principles of fluid mechanics through the understanding of the: conservation of mass, conservation of energy, and the conservation of momentum equations. It is expected that the students will gain a fundamental physical and mathematical understanding of this topic rather than memorizing the equations and situations. By this, it is implied that the student will be able to correctly apply the course content (given in the course overview above) to new situations so as to evaluate potential industrial applications of fluid theory through both physical induction and mathematical analysis/computation. Such inductive and analytical reasoning will be taught through classroom examples and homework, while it will be tested on examinations.
Student's obligation	In this course students are expected to: • Attend all classes. In the event you miss a class, you are responsible for the assignments and announcements made during your absence. • Participate actively in discussions and group exercises. • Prepare for class sessions by reading text assignments. • Attendance at all exams is required. Makeup exams will be given only in emergency cases (proof required). Vacation arrangements are not emergencies. Students who have unexcused absences will receive the grade of zero ("0") for all tests, quizzes, and/or lab experiments missed. Feel free to raise questions (even if you suspect you are the only one who does not know the answer) to ensure that you thoroughly understand and are able to apply the theory in real engineering applications.
Required Learning Materials	• Data show, white board and PowerPoint are used throughout the lecture, Testing in department's Laboratory. • Publish all lecture notes in college website before the lecture day.

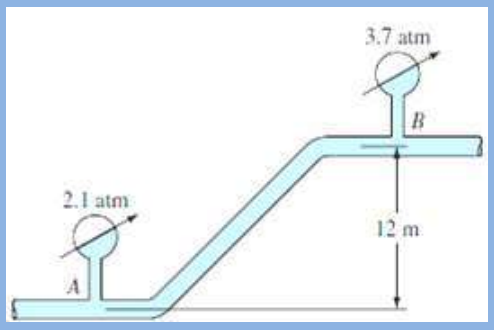
<table>
<tr><td rowspan="11">Evaluation</td><td colspan="2">Task</td><td>Weight (Marks)</td><td>Due Week</td><td>Relevant Learning Outcome</td></tr>
<tr><td colspan="2">Paper Review</td><td></td><td></td><td></td></tr>
<tr><td rowspan="6">Assignments</td><td>Homework</td><td>5%</td><td></td><td></td></tr>
<tr><td>Class Activity</td><td>2%</td><td></td><td></td></tr>
<tr><td>Report</td><td rowspan="4">10%</td><td></td><td></td></tr>
<tr><td>Seminar</td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td></td></tr>
<tr><td colspan="2">Quiz</td><td>8%</td><td></td><td></td></tr>
<tr><td colspan="2">Lab.</td><td>10%</td><td></td><td></td></tr>
<tr><td colspan="2">Midterm Exam</td><td>25%</td><td colspan="2">10% Theory + 15% Practical</td></tr>
<tr><td colspan="2">Final Exam</td><td>40%</td><td colspan="2">20% Theory + 20% Practical</td></tr>
<tr><td colspan="2">Total</td><td>100%</td><td></td><td></td></tr>
<tr><td>Specific learning outcome:</td><td colspan="5">On successful completion of this course, student should be able to:
• Be familiar with the terminology associated with fluid mechanics
• Be able to determine pressure drops for pipe systems and choose appropriate pumps and turbines depending on the application
• Ability to derive the equation for viscous flow, including laminar flow and turbulent flow
• Interpret experimental and test results and present these in an appropriate engineering report format
• Collaborate with others in a team project environment to conduct engineering investigations and produce engineering reports</td></tr>
<tr><td>Course References:</td><td colspan="5">▪ Key references:
• "Fluid Mechanics with Applications" Anthony Esposito, Pearson Education, 1997.
• "Engineering Fluid Mechanics" John A. Roberson, Clayton T. Crowe, Donald F. Elger, and Barbara C. Williams, 9th Ed., John Wiley & Sons, 2009.
• "Fluid Mechanics, Fundamentals and Applications" Y. A. Cengel, J. M. Cimbala, 2nd Ed., McGraw-Hill, 2009.
• "Introduction to Fluid Mechanics" ROBER T W. FOX, and ALAN T. MCDONALD, 6th Ed., John Wiley & Sons, 2004.
• "Fluid Mechanics" Frank M. White, 4th Ed., McGraw-Hill, 1998.</td></tr>
</table>

	• *"**Fundamentals of Fluid Mechanics**" 5th Ed., by Munson, Young, and Okiishi, Wiley 2005.* ▪ **Useful references**: • *"**Fluid Mechanics with Engineering Applications**" Joseph Franzini, E John Finnemore, 10th. Ed., McGraw-Hill, 2001.* • *"**Fluid Mechanics**" Victor L. Streeter, K.W. Bedford, Wylie E. Benjamin, 9th Revised edition, McGraw-Hill, 1998.* • *"**Fluid Mechanics and Hydraulic Machines**", 3rd edition, S. Chand and Company Ltd, New Delhi, 2006.*

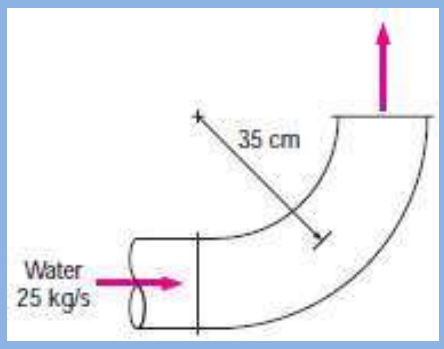
Course topics (Theory)	**Week**	**Learning Outcome**
Flow of viscous fluids in pipelines, typed of flow	1-2	
Reynolds number, major and minor losses	3	
Non-circular cross-sectional area	4	
Series and parallel piping system	5-6	
The momentum equation	7-8	
Application on momentum equation	9	
Dimensional Analysis and Similitude	10-11	
Cavitation	12	
Practical Topics	**Week**	**Learning Outcome**
Frication Loss in Straight Pipe (Major Loss)	1-2	
Friction Loss in Fitting and Valves (Minor Loss)	3-4	
Sudden Enlargement (Head Losses)	5-6	
Sudden Contraction (Head Losses)	7-8	
Series & Parallel Pipe Connection	9-10	

Questions Example Design

Q1/ The 6-cm-diameter pipe shown in figure, contains glycerin at 20°C (S.G. = 1.26 and μ = 1.5 kg/m.s), flowing at a rate of 6 m^3/h. Verify that the flow is laminar. For the pressure measurements shown, is the flow up or down? What is the indicated head loss for these pressures?



Q2/ A 90° elbow is used to direct water flow at a rate of 25kg/s in a horizontal pipe upward. The diameter of the entire elbow is 10 cm. The elbow discharges water into the atmosphere, and thus the pressure at the exit is the local atmospheric pressure. The elevation difference between the centers of the exit and the inlet of the elbow is 35 cm. The weight of the elbow and the water in it is considered to be negligible. Determine (a) the gage pressure at the center of the inlet of the elbow and (b) the anchoring force needed to hold the elbow in place.



Extra notes: No extra notes

External Evaluator

I confirm that the contents of this syllabus are sufficient and cover all the requirements of Fluid mechanics (II) subject.

Prof. Dr. Ahmed Mohammed Adham

01/10/2023